Assessment Activities

Current Projects
Publications in Press
Recent Publications
Selected Publications of Interest

New Assessment Undertakings
(since September 1982)

- Assessment of Maritime Trade and Technology (p. 24)
- Technologies To Measure, Monitor, and Mitigate Ground Water Contamination (p. 24)
- Technology, Innovation, and Regional Economic Development (p. 26)
- Information Technology Research and Development (p. 21)
- U.S. Passenger Rail Technologies (p. 26)

February 1983

CONGRESS OF THE UNITED STATES
Office of Technology Assessment
Washington, D. C. 20510

J952-4

BEST AVAILABLE COPY

Office of Technology Assessment

Congressional Board of the 98th Congress

MORRIS K. UDALL, *Arizona, Chairman*

TED STEVENS, *Alaska, Vice Chairman*

Senate

ORRIN G. HATCH
Utah

CHARLES McC. MATHIAS, JR.
Maryland

EDWARD M. KENNEDY
Massachusetts

ERNEST F. HOLLINGS
South Carolina

CLAIBORNE PELL
Rhode Island

House

GEORGE E. BROWN, JR.
California

JOHN D. DINGELL
Michigan

LARRY WINN, JR.
Kansas

CLARENCE E. MILLER
Ohio

COOPER EVANS
Iowa

JOHN H. GIBBONS
(Nonvoting)

Advisory Council

CHARLES N. KIMBALL, *Chairman*
Midwest Research Institute

EARL BEISTLINE
University of Alaska

CHARLES A. BOWSHER
General Accounting Office

CLAIRE T. DEDRICK
California Land Commission

JAMES C. FLETCHER
University of Pittsburgh

S. DAVID FREEMAN
Tennessee Valley Authority

GILBERT GUDE
Library of Congress

CARL N. HODGES
University of Arizona

RACHEL McCULLOCH
University of Wisconsin

WILLIAM J. PERRY
Hambrecht & Quist

DAVID S. POTTER
General Motors Corp.

LEWIS THOMAS
Memorial Sloan-Kettering Cancer Center

Director

JOHN H. GIBBONS

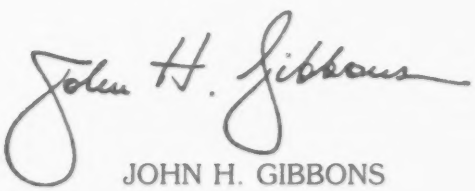
Preface

This booklet is designed to provide Members of Congress and their staffs with:

- brief summaries of our current work projects, organized by OTA Division and Program, and the dates currently projected for their delivery of final draft reports to OTA's Congressional Board;
- notices of publications in press;
- announcements of recently published reports; and
- lists of selected publications of interest.

Legislative deadlines often require OTA to release specific information from an assessment before completion of the project. Frequently this information is conveyed through a staff briefing, testimony, or a technical memorandum.

We will update this booklet periodically and welcome your comments on its value. For additional copies of this booklet, please contact our Publishing Office (202-224-8996).



JOHN H. GIBBONS
Director

Table of Contents

CURRENT PROJECTS

Energy, Materials, and International Security

Energy

The Future of Conventional Nuclear Power . 7
Industrial Energy Use 7
Strategic Responses to an Extended Oil Disruption 8
Potential U.S. Natural Gas Availability 9

International Security and Commerce

Technology Transfer to the Middle East . . . 9
Strategic Command, Control, Communications, and Intelligence 10
International Cooperation and Competition in Civilian Space Activities 11

Materials

Technologies To Reduce U.S. Materials Import Vulnerability 12
Wood: The Material, The Resource 12

Health and Life Sciences

Biological Applications

Impact of Technology on Aging in America 14
Comparative Assessment of the Commercial Development of Biotechnology 14

Food and Renewable Resources

Plants: The Potentials for Extracting Protein, Medicines, and Other Useful Chemicals 15
Water-Related Technologies for Sustaining Agriculture in U.S. Arid and Semiarid Lands 16
Technologies To Sustain Tropical Forest Resources 17

Health

The Medical Devices Industry 18
Medical Technology and Costs of the Medicare Program 19
Evaluation of Veterans Administration Agent Orange Protocol 19
Health and Safety Control Technologies in the Workplace 20

Science, Information, and Natural Resources

Communications and Information Technologies

The Effects of Information Technology on the Structure of the Financial Services Industry 21
Information Technology Research and Development 21
Computerized Factory Automation: Employment, Education, and the Workplace 22

Oceans and Environment

Assessment of Approaches to Wetlands Use 23
Assessment of Maritime Trade and Technology 24
Technologies To Measure, Monitor, and Mitigate Ground Water Contamination . . . 24

Space, Transportation, and Innovation

Civilian Space Stations 25
Airport System Development 26
U.S. Passenger Rail Technologies 26
Technology, Innovation, and Regional Economic Development 26

PUBLICATIONS IN PRESS

Role of Genetic Testing in the Prevention of Occupational Disease 29
Technologies and Management Strategies for Hazardous Waste Control 30
Impact of Technology on Competitiveness of U.S. Electronics Industry 30
Patents and the Commercialization of New Technology 31
Impacts of Atmospheric Alterations 31
High-Level Radioactive Waste Management and Disposal 32
Technological Innovation and Health, Safety, and Environmental Regulations . . 33

RECENT PUBLICATIONS

Industrial and Commercial Cogeneration . . . 35
Informational Technology and Its Impact on American Education 36
Postmarketing Surveillance of Prescription Drugs 36
Medical Technology Under Proposals To Increase Competition in Health Care 37
MEDLARS and Health Information Policy . . . 38

SELECTED PUBLICATIONS OF INTEREST . . 39

CURRENT PROJECTS

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY

The Future of Conventional Nuclear Power

The nuclear reactor manufacturing industry is facing a period of extreme uncertainty. There have been no reactor orders since 1978, and it is quite possible that none will be placed in time to keep existing design and manufacturing capabilities intact. The principal reason has been the decline in electricity demand growth that has greatly reduced the near-term need for new generating capacity. Other factors and perceptions about nuclear power—e.g., safety concerns, costs, reliability questions—have also contributed to the industry's difficulties. In order for the nuclear option to be available, and to be acceptable to the utilities, regulators, and the public, substantial technical and institutional changes may be needed.

This assessment will examine the major technical considerations about the future of conventional nuclear power and how these technologies can affect economic, regulatory, and institutional (e.g., Government and industry responsibilities) issues that govern that option.

Technical issues to be studied include potential improvements to existing reactors such as higher fuel burn up and increased reliability; reoptimized and standardized light water reactors; and different reactor types such as HTGR or CANDU reactors. The consequences of these possible changes on licensing, reactor costs, safety, industrial structure, and public perception will be examined.

Delivery date: Summer 1983. Call 226-2151 for further information.

Requested by: House Science and Technology Committee. Endorsed by: Senate Committee on Energy and Natural Resources and House Committee on Interior and Insular Affairs.

Industrial Energy Use

This project is designed to examine a series of four American industries (pulp and paper, steel, petroleum refining, and organic chemical production) for their potential to use energy more efficiently, and to predict the impact of selected legislative options on energy use and efficiency within those industries.

OTA will examine the available technologies designed to improve energy efficiency, as well as the barriers to such technology's implementation. The legislative options to be examined range from tax policy changes such as accelerated depreciation to institutional changes in capital financing methods. Each option's effects will be evaluated through a series of case studies in which corporation executives, consultants, and computer-modeling techniques are used to forecast the impacts of possible congressional action. Options will also be examined at the industry, industrial sector, and national energy use and economic levels using a similar series of modeling, management, and consultant evaluation.

Delivery date: Early 1983. Call 226-2152 for further information.

Requested by: House Committee on Energy and Commerce. Senate Committee on Finance.

Strategic Responses to an Extended Oil Disruption

Over the next decade, there is a high probability that the Nation will experience a disruption in imported oil of a level that will exceed the capabilities of the Strategic Petroleum Reserve and seriously affect the economy.

This assessment will examine the opportunities and problems that characterize various technical responses that could supplement the Strategic Petroleum Reserve to meet such an interruption. The objective will be to determine what available resources might be expanded, the technical limitations for fuel substitution and switching, the physical constraints of stockpiling resources, and the impacts of accelerating the use of these technologies. Technologies to be considered will include enhanced oil recovery; adapting industrial boilers to dual-fuel capacity; biomass production; high-voltage transmission; hydro; wind; direct solar; vehicle retrofits; photovoltaics; retrofitting building envelopes and heating/cooling systems; retrofitting vehicles to improve mileage efficiency; and switching capacity of petroleum refineries. The study will be done at national and regional levels.

The assessment will be completed in two phases. Phase I will draw on OTA staff resources to collect data on the technical capabilities and constraints of the intervention technologies, and develop a summary document on potential of the technologies to alleviate the effects of various levels of oil disruption. In Phase II, OTA will examine the most promising technologies in greater detail, including complicated questions such as refinery-switching capacity, burner substitution logistics, electrical grid capacity and requirements.

Delivery date: Summer 1983. Call 226-2152 for further information.

Requested by: Senate committees: Governmental Affairs; Foreign Relations.

Potential U.S. Natural Gas Availability

In the past few years there has been a change in the outlook about the potential for natural gas production in the lower 48 States. Recent optimistic projections by some groups have stimulated efforts to revise current natural gas policy so that natural gas can play a bigger role in reducing this country's oil imports. There remains, however, considerable uncertainty about how much the United States can rely on natural gas, which is tempering this optimism. This assessment is designed to help determine domestic (lower 48 States) onshore natural gas availability over the next few decades, and to help understand the factors that affect this availability. The OTA assessment will: 1) analyze the key technical and physical parameters that determine the resource base, production rates, and costs of all categories of below-ground natural gas; 2) critically review current estimates of the resource base, estimate the potential production rates of natural gas, and analyze the uncertainties in these estimates; 3) assess future technology trends, research and development needs that may accelerate these trends; and 4) analyze the institutional and policy issues appropriate for a Federal role in dealing with barriers to production.

Delivery date: Technical Memorandum, spring 1983; Final report, late 1983. Call 226-2152 for further information.

Requested by: House Committee on Energy and Commerce. Endorsed by: Subcommittee on Energy, Research, and Development, Senate Committee on Energy and Natural Resources.

Technology Transfer to the Middle East

During the last decade, the Middle East has been the world's fastest growing market, one which West European, Asian, and Communist as well as U.S. enterprises have all sought to penetrate. The oil-rich nations of the region have the financial resources to purchase the most advanced equipment and technology, both civilian and military. Technology transfers on such a large scale may have important implications for both the recipient and supplier nations. However, there has been little systematic study of the extent or effectiveness of transfers of Western technology. This study will assess the commercial and strategic ramifications of transfers of advanced Western technologies (in sectors such as operation and maintenance of aircraft, petrochemical production facilities, nuclear powerplants, communications, and service systems) in order to provide a foundation for U.S. policy development.

The objectives of OTA's study are to assess past experience with technology transfers to the Middle East, to investigate the capability of these nations to effectively absorb advanced Western technology, to evaluate the likelihood of continued and expanding transfers in the years ahead, and to discuss the implications for American foreign and international economic policy.

16-973 O - 83 - 2

The following questions will be addressed:

- How extensive have transfers of advanced Western technology to the Middle East been in recent years, what factors have determined which nations supply which technologies, and through what channels has transfer occurred?
- What factors inhibit or enhance the ability of Middle Eastern nations to absorb and master Western technology? Has it been the case that transfers in certain technology sectors have been particularly "successful," or that the experiences of various recipient nations differ significantly?
- What have been the effects—economic, social, and political—of advanced technology transfers on both recipients and suppliers?

In some sectors, such as petrochemical production, technology transfers augur shifts in world markets, while in other sectors, such as medical services, they promise improvements in local living conditions. Nuclear technology transfers, in contrast, raise critical strategic questions. This study will evaluate the opportunities and liabilities which advanced technology transfers portend for U.S. foreign and commercial policy in the years ahead.

Delivery date: Late 1983. Call 226-2016 for further information.

Requested by: House Committee on Science and Technology. Senate Committee on Banking, Housing, and Urban Affairs.

Strategic Command, Control, Communications, and Intelligence (C^3I)

U.S. strategic nuclear forces are intended to deter hostile Soviet actions, and to do so in a way that contributes to international stability. Their ability to meet these objectives depends not only on the character and capabilities of the weapons systems themselves, but also on the character and capability of the supporting C^3I systems. Specifically, both deterrence and stability may depend on: 1) the reliability with which a Soviet attack can be detected; 2) the timeliness and quality of the information about such an attack that can be assembled; 3) the speed and reliability with which this information can be communicated to the National Command Authorities; and 4) the immunity to disruption of communications between the National Command Authorities and the strategic forces.

The technical difficulty of making strategic weapons themselves survivable was a major focus of OTA's study of "MX Missile Basing." The problems of assuring the reliability and survivability of the systems that control these weapons are at least as difficult.

The purpose of the study is to assess the technical capabilities and vulnerabilities of present U.S. strategic C^3I systems. The study will identify needs and opportunities for improvement in the present systems, with special em-

phasis on additions to the systems that could usefully be made in the near term with available technology. Promising avenues of research for future improvements will also be identified.

In order to carry out a meaningful study in the short time available, the study will emphasize: 1) central strategic forces, excluding European-based nuclear forces or general purpose forces; 2) the period of several hours after launch of the first enemy missile; and 3) situations in which the President is located at the White House, Camp David, or another prepared location at the time the attack begins.

Delivery date: Spring 1983 (Classified). Call 226-2020 for further information.

Requested by: Chairman, Technology Assessment Board. Senate Committee on Appropriations.

International Cooperation and Competition in Civilian Space Activities

Over the next decade, the United States will face strong commercial competition from foreign space technology, and considerable interest from developing countries in cooperative ventures in space science and space applications technologies. This project will evaluate the current status of international competition and cooperation in key areas of space technology, in space science, and for educational and scientific exchange. It will investigate ways in which space technologies and their products could be used as instruments of U.S. foreign policy, and examine military space activities insofar as they affect civilian programs and international commercial and political relations. The project will also assess the implications of various policies to enhance cooperation and/or competition with foreign entities. There will be two distinct but related parts, one assessing U.S. relations with industrialized countries, the other with developing countries. The former will focus on French and Japanese space technology and the institutional mechanisms that have made them strong competitors with U.S. aerospace firms. The latter will focus on the uses of space technology in less developed countries, and evaluate the technical and economic issues that were evident in the United Nations Conference on the Peaceful Uses of Outer Space (UNISPACE '82).

Concern over the U.S. competitive stance vis-a-vis foreign space technology will be a part of the congressional agenda for the next several years, prompted by the development of the space shuttle and by concern over the U.S. position as an international leader in advanced technologies. Whether we are making the best use of space technology and space science as elements of our foreign policy, growing military space activities, and whether the United States is well enough prepared for international technical conferences such as UNISPACE '82 are also of concern to Congress.

Delivery date: Technical Memorandum, early 1983. Full report, summer 1983. Call 226-2209 for further information

Requested by: House Committee on Science and Technology. Joint Economic Committee.

Technologies To Reduce U.S. Materials Import Vulnerability

The United States currently imports over one-half of its consumption of each of a number of commonly used materials. Included among those imported are several considered to be vital for national defense (strategic) and important to the U.S. industrial economy (critical). Several of the most important defense-related materials have only a small number of supplier countries and these are largely southern African nations, other developing countries, and the U.S.S.R. Raw material supplies are not the only strategic concern. For example, because of the changing world economy, the United States has lost a considerable portion of its capacity to produce ferromanganese and ferrochrome to foreign competition.

The focus of the study will be on technical opportunities to reduce our vulnerability to interruptions in supply of strategic and critical imported materials in the longer term (5 to 25 years) through, for example, substitution, including materials, process and product substitution, improved mining, processing and recycling technologies, and more efficient fabrication and design.

The study will also identify major changes in materials vulnerability that are likely to occur over the next 25 years because of advances in such fields as electronics, energy, and transportation.

Delivery date: Technical Memorandum, spring 1983; Full report, early 1984. Call 226-2269 for further information.

Requested by: House Committee on Science and Technology. Senate Committee on Commerce, Science, and Transportation.

Wood: The Material, The Resource

The United States has 483 million acres of commercial forestland: 14 billion cubic feet of timber were harvested in 1976. However, the United States still imports nearly 30 percent of its softwood lumber, approximately half of its wood pulp, and significant quantities of plywood. The forest industry and Government experts state that with new technologies for improved forestry practices, better wood utilization, and new product development the United States could become at least independent of wood imports and possibly a net exporter of wood. If domestic wood production is to be increased significantly, policies will be needed to: 1) improve the management of private timberlands; 2) resolve conflicts among the users of Federal public lands; and 3) investigate new uses and applications of wood materials. New technologies for the use of wood, which is a renewable resource, may also hold promise as substitutes for nonrenewable energy and materials resources in some applications.

This assessment has six objectives: 1) explore the properties, uses, and technologies for using wood as a material and its potential for substituting for nonrenewable materials; 2) assess the future demand and supply profiles of wood and identify future problems; 3) evaluate the capability of forest management technology to increase production; 4) analyze the forest management policies on public lands in reference to wood production and other forest uses; 5) assess the national technology for wood and forestry R&D; and 6) review public policies that affect forest production and the use of wood as a material and identify policy options for dealing with future problems.

The assessment is being conducted by the OTA Materials Program with consultation among other OTA program offices and other congressional agencies. Initial efforts will center on the identification of policy issues affecting the production and use of wood materials. A comprehensive review of wood technology and the potential for the future development of wood products will be undertaken. An assessment of the current state of forestry technology and the breadth of its field application will be conducted.

Ample use will be made of the planning documents and assessments directed by the Forest and Rangeland Renewable Resources Planning Act and the National Forest Management Act of 1976. Finally, options for congressional consideration will be formulated for dealing with the identified problems and issues by bringing together the potential technological solutions with the public policy perspectives of timber production.

The assessment will cover a period of 18 months; from October 1981 through March 1983. One interim Technical Memorandum is planned: Technologies for Improved and Expanded Wood Utilization.

Delivery date: Spring 1983. Call 226-2269 for further information.

Requested by: Senate Committee on Appropriations. Endorsed by: House Committee on Agriculture, Subcommittee on Forests, Family Farms, and Energy.

HEALTH AND LIFE SCIENCES

Impact of Technology on Aging in America

The aging of the American population raises critical concerns for employment, the retirement system, transportation, health care, recreation, and housing. The large increase in numbers of the 65-year and older age group has occurred because of technological advances that have resulted in better control of infectious and chronic diseases and improved standards of living. New technologies under development today suggest continued change in longevity and functional capacity.

Most current projections of the impact of our aging population assume an elderly population with characteristics similar to that population today—withdrawal from the work force, declining health, increased needs for hospitalization and nursing care, and other characteristics that suggest a highly dependent 65-year and older age group. However, improved health care, increased understanding of the physiology of aging, and other advances in technology may alter the characteristics of the elderly of the future. In addition, applications of computers, robotics, telecommunications, and other technical innovations in the home and workplace may provide new opportunities for increasing the independence, productivity, and quality of life for this segment of our population.

Four areas where the impact of technology will be assessed are health and life sciences, employment, housing and public services, and international aspects (examples of responses to elderly populations in other industrialized countries).

Delivery date: Spring 1984. Call 226-2090 for further information.

Requested by: House Select Committee on Aging. Senate Special Committee on Aging. Endorsed by: House Committee on Education and Labor. House Select Committee on Aging.

Comparative Assessment of the Commercial Development of Biotechnology

"Biotechnology" refers to the use of biological techniques such as recombinant DNA technology, cell fusion, fermentation, and enzyme technology to produce chemicals, pharmaceuticals, or other substances to act on the environment to increase the quality of life (as in pollution control), or to improve the characteristics of economically important plants and animals. Advantages of biological production over the alternative methods of chemical production or extraction of substances from living tissues include reduced dependence on petroleum substrates or on large quantities of sometimes scarce

plant, animal, or human tissues. Estimates of yearly potential markets for substances that could be produced from applications of recombinant DNA technology in just the chemical and pharmaceutical industries are $15 billion and more in the next 20 years.

The potential of biotechnology has stimulated a great deal of corporate activity in the United States in the last 2 years. Many new small firms have been formed and large corporations are developing capability in biotechnology. Foreign activity in the field is intense, especially in Japan, West Germany, France, and the U.S.S.R.

This assessment will evaluate whether biotechnology and associated research and development are developing in the United States in such a way that this Nation is likely to be in a competitive position with other nations in the years ahead. The keys to competitive development of the biotechnology industry in the United States are basic research and the transfer of basic research into commercial application. One major influence on development of the industry in the United States is Government policies on funding of research, patents, health and safety regulations, antitrust laws, and taxation. Equally important and significantly influenced by Government policy are industrial/academic relationships and their influence on funding, research, personnel training, and information flow. New developments in the technology and in support technologies are important to the growth of the industry and will also be examined as part of this assessment. Analysis along the same dimensions as those above will be conducted for selected other countries in order to estimate the probable U.S. position in the biotechnology industry in the next 10 years.

It is also important to consider areas of application in the public interest. Attractive commercial applications may so engage industry that some areas, of great public benefit but higher commercial risk, could languish. The possible Government role in such areas will be investigated.

Delivery date: Summer 1983. Call 226-2090 for further information.

Requested by: House Committee on Science and Technology. Senate Committee on Commerce, Science, and Transportation. Endorsed by: Senate Committee on Labor and Human Resources.

Plants: The Potentials for Extracting Protein, Medicines, and Other Useful Chemicals

Land and marine plants are known to contain some valuable chemical substances that are used in foods for humans and animals, or in pharmaceuticals, pesticides, chemicals, and other products. These compounds are synthesized naturally using the energy from the Sun. Plant products range from oils, gums, and resins to important drugs. Only certain of these naturally occurring compounds have been synthesized in the laboratory. Further, an unknown but probably vast resource of such compounds remains uncharacterized and undeveloped.

Today, renewed attention is being directed to the identification and extraction of plant chemicals and to devising systems for multiple use of a plant's various components. For example, some research points to the possibility of growing tobacco specifically for the purpose of extracting protein from the leaves. The protein that might be extracted from plant leaves could be used to supplement human and animal food, and possibly aid in the treatment of kidney disease.

OTA conducted a workshop designed to identify technological opportunities and constraints for commercially developing protein, pharmaceuticals, chemicals, and other associated extracts from plants generally and tobacco specifically. OTA will examine the potential impacts that such technologies might have on improving nutrition and food quality by increasing the availability of high-quality protein. Issues that will be addressed include: 1) quality of current data bases on chemistry of plant extracts; 2) status of bioassay technologies; and 3) possible social, economic, environmental, and political impacts that such new technologies might generate.

Delivery date: Early 1983. Call 226-2264 for further information.

Requested by: Senate Committee on Agriculture, Nutrition, and Forestry.

Water-Related Technologies for Sustaining Agriculture in U.S. Arid and Semiarid Lands

Freshwater is a controlling factor of U.S. agricultural productivity. In recent years, the availability of high-quality freshwater for agriculture, especially in the arid and semiarid United States, has become a major concern. In particular, competition for available water supplies, overdraft of underground aquifers, and deteriorating water quality have contributed to severe water supply problems for arid and semiarid U.S. agricultural lands (those receiving about 20 inches or less of rainfall annually).

The principal farming systems in arid and semiarid U.S. lands are irrigation agriculture, dryland farming, and ranching. Irrigation agriculture is one of the most seriously affected by reduced water supplies. This farming system accounts for over 80 percent of all consumed water withdrawn from streams and underground aquifers. About 90 percent of U.S. irrigated land is in the 17 Western States where water is in short supply. In California, Arizona, New Mexico, Nevada, Utah, Wyoming, and Idaho, for example, over 80 percent of the crops are produced with irrigation. Agricultural water supplies suffer from declining water tables as well as agriculture's inability to compete on the open market for the water that is available. Energy costs become a particularly critical factor as water must be transported from greater distances or lifted from deeper aquifers. In addition, many conventional agricultural systems use available water inefficiently. The seriousness of the problem necessitates an assessment of present and emerging water-related technologies and their potential for sustaining arid and semiarid agriculture in the United States.

This assessment will focus on the opportunities of present and emerging technologies to provide long-term sustainable agricultural productivity by increasing efficiency of water use and reducing agricultural water demands in arid and semiarid U.S. lands. The ability of such technologies to improve water quality of agricultural runoff and the associated socioeconomic impacts also will be examined.

Technologies considered will include those that require modification of existing systems to maintain the present style of agriculture and those that involve fundamental changes through the adoption of low-water-demand biological technologies and systems. The assessment will include a critical review of data on the magnitude of the arid/semiarid water problem, potentials for alternative supplies, and possible legal and institutional mechanisms supportive of the adoption of sound agricultural water-related technologies.

Delivery date: Spring 1983. Call 226-2223 for further information.

Requested by: House Committee on Agriculture. Endorsed by: Senate Committee on Environment and Public Works, Subcommittee on Water Resources.

Technologies To Sustain Tropical Forest Resources

Each year 1 to 2 percent of the world's remaining tropical forests are converted to other land uses or to wasteland. Where cleared land is developed for sustained agriculture, deforestation can be beneficial. But most land now being cleared cannot sustain farming or grazing with available technologies, so it is abandoned after a few years. Often the forests do not regrow because of highly weathered soils and harsh climates. Thus, highly productive but underused forest resources are giving way to grasslands and deserts of low productivity.

Deforestation has economic and environmental consequences that jeopardize U.S. imports of agricultural germ plasm, pharmaceuticals, chemical feedstocks, foods, drugs, animals for medical research, tropical hardwoods, and veneer and wood products. Also in jeopardy are U.S.-funded development projects in tropical countries, U.S. migratory wildlife species, and stability of global climates. Tropical deforestation places pressure on world oil supplies and is an important causal factor in the increasing number of refugees seeking U.S. entry.

The U.S. Agency for International Development (AID), the United Nations (U.N.) agencies, and the World Bank have increased funding for forestry severalfold in the past 5 years. American corporations and nonprofit institutions also have been increasingly involved in the search for solutions to tropical deforestation problems. Most importantly, many tropical nations' governments recognize that deforestation constrains their economies and their development options; they are now making institutional changes to slow deforestation and to accelerate reforestation.

16-973 O - 83 - 3

The United States is recognized for its leadership in bringing the deforestation problems to world attention and for the technical versatility it has to address the problem. Sustaining tropical forest resources can be helped or hindered by applications of certain technologies. OTA will assess: 1) dimensions of the tropical deforestation problem; 2) impacts of technologies, both conventional and new, that the United States may apply to enhance use and management of forest resources; 3) the role that U.S.-funded agencies, such as AID, Peace Corps, the U.N., and the World Bank, play in developing improved technologies; 4) improved mechanisms for transferring such technologies to tropical nations and to tropical regions of the United States; and 5) the special strengths of U.S. institutions in relevant science and technology.

Delivery date: Spring 1983. Call 226-2192 for further information.

Requested by: House Committee on Foreign Affairs. Senate Committee on Energy and Natural Resources. Endorsed by: Subcommittee on Insular Affairs of the House Committee on Interior and Insular Affairs; Subcommittee on Environmental Pollution of the Senate Committee on Environment and Public Works.

The Medical Devices Industry

During the past two decades, technologies such as automated blood chemistry analyzers, ultrasound imaging, and cardiac pacemakers have become common elements of medical diagnosis and therapy. The growth of the industry that manufactures such technologies has paralleled the growth of expenditures for medical care. The industry's sales totaled an estimated $13 billion in 1981, more that three times the 1972 level and 11 times the amount in 1958.

Congress is continually called on to develop policies that will affect the medical devices industry, but in the past has lacked adequately analyzed information to appropriately deal with the subject. Federal policies related to the research, marketing, location, and financing (medical insurance) of medical technologies, as well as to the taxation, patenting, and foreign trade of all technologies, affect the development, manufacture, and sale of medical devices.

This assessment will eliminate some of the gaps in basic information about the medical devices industry and analyze the implications of alternative Federal policies. The assessment will develop information about the nature of firms that manufacture medical technologies, conduct case studies of selected medical devices, and examine present and proposed Federal policies that influence the medical devices industry and in turn the cost and effectiveness of medical devices.

Delivery date: Spring 1984. Call 226-2070 for further information.

Requested by: Senate committees: Labor and Human Resources; Veterans Affairs.

Medical Technology and Costs of the Medicare Program

The costs of the Medicare program have been rising rapidly, and medical technology is a prime component of this increase. Of the $247 billion spent on national health expenditures in 1980, the Federal Government paid more than $70 billion, and of that amount nearly $37 billion was for Medicare. A substantial portion (perhaps as high as 50 percent) of increases in total health care costs has been attributed to an increase in the use of new and existing medical technologies.

Reimbursement policy has, in the view of many, led to rapid adoption and often excessive use of medical technologies. One approach to curtailing the growth of costs in the Medicare program is to change the ways in which medical technologies are added to Medicare coverage and the ways in which their use is paid for. For example, certain prospective reimbursement schemes (such as the use of diagnostic-related groups) or the encouragement of cost-reducing technologies have been suggested as ways to reduce Medicare costs. The project is analyzing a broad range of mechanisms to reduce or limit Medicare costs related to medical technology. In addition, it includes case studies of particular medical technologies. Four have been specifically requested: plasmapheresis, alcoholism treatment, variations in length of hospital stay, and continuous ambulatory peritoneal dialysis.

Delivery date: Summer 1983. Call 226-2070 for further information.

Requested by: House Committee on Energy and Commerce. Senate Committee on Finance.

Evaluation of Veterans Administration Agent Orange Protocol

The epidemiologic study by the Veterans Administration of the long-term health effects resulting from exposure to agent orange was mandated in the Veterans Health Programs Extension and Improvements Act of 1979 (Public Law 96-151). The same law requires OTA to review the study design and monitor the conduct of the study. An advisory panel was assembled to carry out the review. The study design was tentatively approved in March of 1982. The Centers for Disease Control will carry out the study. OTA will continue to monitor the study and its progress.

Delivery date: Indeterminate. Call 226-2070 for further information.

Requested by: Mandated by Public Law 96-151.

Health and Safety Control Technologies in the Workplace

One hundred million Americans work. Each year there are some 2.3 million disabling injuries and 13,200 accidental deaths in the workplace, and perhaps 100,000 people die from job-related diseases. Efforts to reduce this toll involve employers, labor organizations, nonprofit institutions, insurance companies, and Government agencies. To a major extent these efforts are directed at developing and applying control technologies—engineering controls, worker education programs, and personal protection devices.

New industrial plant construction and modernization of existing plants is expected to result from interest in increased productivity and reduced energy consumption. Such construction may offer opportunities for installing new technologies to reduce workplace health and safety hazards.

This assessment would develop information about research and development, diffusion, application, and evaluation of workplace control technologies. Engineering controls, worker education programs, personal devices, and interrelationships between them will be described and their role in worker protection evaluated.

One product of the assessment would be a series of options. These are expected to address:

- improving data about workplace accidents and illnesses;
- aiding development of appropriate technologies, their diffusion, application, and evaluation; and
- making control technologies available to small firms at a price they can afford.

Delivery date: Early 1983. Call 226-2070 for further information.

Requested by: House Committee on Energy and Commerce. Endorsed by: Senate Committee on Labor and Human Resources.

SCIENCE, INFORMATION, AND NATURAL RESOURCES

The Effects of Information Technology on the Structure of the Financial Services Industry

The use of new telecommunication and computer technologies in the financial industry is changing both the character of the industry and the relationships between it and its customers. The technology allows financial institutions to alter and diversify the services offered, to distribute them more broadly, and to link them together into national and worldwide networks. Technology also enables firms that have not previously offered financial services to enter the market—firms often unconstrained by the regulatory structure under which traditional providers of financial services have operated. Future technological developments may offer additional possibilities for the development of innovative financial services for both individual consumers and businesses. Thus, technological imperatives could significantly change the structure of the financial services industry, an area of economic activity that has long been of interest to Congress.

This study will examine: 1) technologies that are likely to be employed in delivering financial services in the future; 2) the nature of the services that may be provided; and 3) alternative structures of the financial services industry that may emerge as a result of applying new and existing technologies, particularly as they affect Federal policy.

Delivery date: Winter 1983. Call 226-2201 for further information.

Requested by: House Committee on Banking, Finance, and Urban Affairs.

Information Technology Research and Development

Computer and communications technologies are vital components of the domestic economy. In 1981, computers and business machines alone provided a $6.9 billion surplus to the U.S. balance of trade. Computer and communications also form the information services network that supports and enhances productivity in every other sector of the economy. In addition, they are indispensable components of our national security system.

Underlying current U.S. leadership in information technology has been a strong national research and development effort led in communications by the industrial sector, and in computers by both industry and government. Those traditional patterns of research and development are likely to alter significantly due to shifts in industry structure, Federal science and technology

policy, international competition, and technological advances that are now taking place. These changes will affect who will do research, what areas are chosen, levels of support, and the balance between long-term exploratory research and short-term development. They will be strongly influenced by Federal policy, both directly by trends in R&D support and indirectly by tax, antitrust, regulatory, copyright, and education policy.

OTA will characterize those shifts in R&D, project their implications for U.S. leadership in computer and communication technology, and analyze the potential influences of Federal policy on the directions and levels of R&D support.

Delivery date: Early 1984. Call 226-2247 for further information.

Requested by: House committees: Science and Technology; Energy and Commerce. Endorsed by Senate Committee on Commerce, Science, and Transportation; Subcommittee on Science, Technology, and Space.

Computerized Factory Automation: Employment Education, and the Workplace

In this decade, new computer and communication technology will provide the foundation for a new wave of industrial automation based on such applications as computer-aided design (CAD), computer-aided manufacturing (CAM), robotics, and management information systems. These technologies will be merged to form flexible manufacturing systems.

While computerized (or "programmable") automation is expected to enhance the productivity and competitiveness of the particular industries that use it, it is also likely to have significant broader impacts on the Nation's economy, industrial structure, and workforce. Computerized automation will thus present both opportunities and problems to Federal policymakers concerned with the state of the U.S. economy, international trade, employment, and labor training programs.

The objectives of this assessment will be to:

- Assess trends and the state of research and development in computerized manufacturing technologies over this decade.
- Assess the development of industries producing computerized manufacturing equipment, software, and services.
- Assess the potential utility of computerized automation for various categories of manufacturing industries that might use it.
- Assess impacts on employment—job loss, job creation, job redefinition; new skill needs; and workplace quality.
- Assess implications for education and training, for general technological literacy, for specialized vocational skills, and for scientific and engineering expertise.

- Analyze the impacts of Federal policy options on the development and use of computerized automation systems in U.S. manufacturing.

Delivery date: Fall 1983. Exploratory Workshop on the Social Impacts of Robotics (Background Paper), published February 1982. Call 226-2182 for further information.

Requested by: Joint Economic Committee; Senate committees: Commerce, Science, and Transportation; Labor and Human Resources. House Committee on Science and Technology. Endorsed by: House Committee on Education and Labor, Subcommittee on Labor Standards.

Assessment of Approaches to Wetlands Use

Both the development and the preservation of wetlands—swamps, marshes, bogs, and other areas that are periodically saturated with water—offer benefits to individual users of wetlands as well as to society as a whole. For example, when drained or filled, some wetlands may be converted into highly productive farmland or choice residential or commercial property. Valuable oil, gas, and timber resources may also be extracted from some wetland areas. Many other technological activities, such as the construction of dams, levees, breakwaters and jetties, and bridges and highways, often take place in wetlands. Similarly, undeveloped wetlands may provide flood control, fish and wildlife habitat, erosion protection, pollution control, and ground water recharge.

In the past, the values of undeveloped wetlands have largely been ignored or seen as less than those of developed or technologically modified wetlands. As a result, approximately 30 percent of the Nation's wetlands have been modified in some way by various technological activities. During the last decade, the importance of the natural functions of wetlands has received increasing recognition. In response to concerns about wetlands, many Federal and State laws now influence the development of wetlands and regulate their use through measures such as acquisition, economic incentives, and permitting.

Proposals to develop wetlands have frequently led to controversy. To provide a framework for future debates on this issue, OTA will evaluate:

- the effects of technological activities on wetlands,
- technological and nontechnological options for mitigating undesired impacts,
- the functional values of different types of wetlands,
- problems associated with weighing the benefits of technological activities in wetland areas against the functional values of the wetlands that may be lost, and
- various approaches to wetlands use.

Delivery date: Early 1983. Call 226-2130 for further information.

Requested by: Senate Committee on Environment and Public Works.

Assessment of Maritime Trade and Technology

The application of new technology within the maritime industry appears to have produced far more benefits to other nations than to the United States. While the United States is the world's foremost trading nation, the ships that carry over 95 percent of that trade are registered in other countries. Shipbuilding in the United States is at a low ebb. Compared to other maritime nations, U.S. productivity is low and shipyards are technologically behind.

Congress will be considering a wide range of maritime legislation, including proposals to amend the Merchant Marine Act of 1920 and the Merchant Marine Acts of 1936 and 1970. In so doing, Congress will weigh and decide among alternative policies for ensuring an economically viable U.S. maritime industry. Administration proposals and international proposals for cargo sharing and restricting open registries will be debated. This study is intended for congressional use in comparing alternative policies in the light of trends and prospects in shipping and shipbuilding technologies and in international trade patterns.

A number of significant changes in Federal maritime policy have been recently proposed or implemented in an effort to reduce subsidies, eliminate unnecessary regulation and provide a more competitive and productive economic environment. While these goals are broadly supported, it is not clear which methods will be most effective for achieving them and, at the same time, maintaining an adequate industrial base. This study is analyzing the status of the U.S. technology in shipping and shipbuilding and comparing trends in maritime trade with national and international maritime policies.

The study is being accomplished first through a series of status and trend reports on world trade, the maritime industry, and shipping and shipbuilding technologies, which will then be compared and integrated. A separate analysis of international and national maritime policies and key Federal policy options will be identified and future trends will be analyzed.

Delivery date: Fall 1983. Call 226-2044 for further information.

Requested by: House committees: Merchant Marine and Fisheries; Ways and Means.

Technologies To Measure, Monitor, and Mitigate Ground Water Contamination

Ground water resources presently supply about 25 percent of all freshwater requirements in the United States, including about 50 percent of domestic drinking water needs. At the same time, the Nation is increasing its use of the subsurface for waste disposal and other nonwaste-related purposes that are threatening the quality of the ground water resource. Ground water contamination that can be attributed to human activity is being detected nationwide and with increasing frequency, and it can have serious and long-lasting

impacts on human health, the environment, and local and regional economies.

Because the conditions that have been identified as giving rise to ground water contamination are so pervasive, there is a growing national concern about the amount of contamination that has yet to be detected and the vulnerability of this national resource to still further degradation. This study would provide a comprehensive technical framework to assist Congress in understanding and addressing the major ground water contamination issues facing the Nation. These issues would relate to the "process" of contamination, from its occurrence and detection, to its associated impacts, mitigation, and/or management. Proposed issues to be examined include determining the extent and nature of the Nation's ground water contamination, characterizing the transport and fate of contaminants, monitoring information management, and mitigating ground water contamination. Key Federal policy options would also be addressed.

Delivery date: Late 1983. Call 226-2044 for further information.

Requested by: Senate Committee on Environment and Public Works.

Civilian Space Stations

Over the past quarter century, the United States has continued to increase its capabilities for operating in space. The success of the fourth shuttle flight has brought the vehicle to operational status. The shuttle will require a certain amount of follow-on work, but the National Aeronautics and Space Administration (NASA) is now ready to undertake a major new project and is actively planning to propose the development of a permanent manned facility, or space station, to be placed in low-Earth orbit. NASA is reportedly planning to spend some $40 million on an in-house study in 1984 in preparation for initiating this program, and has already formed a task force to manage it; the overall, multiyear effort is estimated to cost $8 billion to $20 billion.

This assessment of nonmilitary space stations addresses the following issues: What advances in science and technology, current or expected, make development of a space station attractive now? What services could a station provide to the civilian sector? Who are the potential users? Given an identified community of users, can their needs be met most effectively by means of a station? Are there additional science and applications needs that a station cannot meet? Are there alternative facilities in prospect that could meet such requirements? If so, is the argument for a space station weakened? What are the prospects for international cooperation in its construction and use? What reasonable solutions exist for potential conflicts between military and civilian interests?

Delivery date: Technical Memorandum, spring 1983; Full report, spring 1984. Call 226-2214 for further information.

Requested by: Senate Committee on Commerce, Science, and Transportation. Endorsed by: House Committee on the Budget; Senate Committee on Appropriations, Subcommittee on HUD-Independent Agencies.

Airport System Development

The National Airspace System Plan issued by the Federal Aviation Administration (FAA) in January 1982 states that "airport capacity limitations at busy airports will be the constraining element in the National Airspace System." FAA anticipates that few, if any, new air carrier airports will be built in the next 20 years and that capacity expansion of existing airports will be severely limited by the availability and cost of land, concern about the environment and airport noise, and constraints on airport access. OTA will assess the technologies to be applied to increase capacity or improve service at airports and the mechanisms by which the technology can be deployed and brought to bear on the problems of civil aviation.

Delivery date: Summer 1983. Call 226-2214 for further information.

Requested by: House Committee on Public Works and Transportation. Endorsed by Senate Committee on the Budget.

U.S. Passenger Rail Technologies

The recent announcement by the newly formed, privately chartered American High Speed Rail Corp. of its planned $2 billion high-speed passenger rail corridor between Los Angeles and San Diego has stimulated existing congressional interest in the introduction of high-speed and other advanced rail technologies, including magnetic levitation, in the United States. This interest is also reflected in the growing number of private and publicly funded feasibility studies of these technologies in selected regions and transportation corridors. OTA will assess these intercity passenger rail technologies and the potential impacts of their introduction in the United States.

Delivery date: Spring 1983. Call 226-2356 for further information.

Requested by: House committees: Appropriations, Subcommittee on Transportation; Energy and Commerce, Subcommittee on Commerce, Transportation, and Tourism. Senate Committee on Commerce, Science, and Transportation.

Technology, Innovation, and Regional Economic Development

In the last 10 to 20 years, several regions of the United States have developed strong local economies based on fast-growing "high-technology" firms engaged in the systematic development and commercialization of new products, processess, and services. These firms and the industries they compose are an important factor in U.S. international competitiveness and a major source of new manufacturing jobs. Several Federal policies are aimed at encouraging their growth. Many State and local development programs are also

based in part on strategies for attracting or stimulating the formation of small, high-technology companies.

Congressional concern for the role of industrial innovation in a well-balanced program for national economic development and revitalization is demonstrated in recently enacted legislation, including the Stevenson-Wydler Technology Innovation Act of 1980, the Small Business Innovation Development Act of 1982, and the research- and investment-related provisions of both the Revenue Act of 1978 and the Economic Recovery Tax Act of 1981. Legislation now pending and likely to be reintroduced in Congress addresses related policy issues, including Federal R&D policy, capital formation, export competitiveness, manpower training, community development, and the needs for technical assistance and financing mechanisms at the State and local levels.

The assessment will determine where high-technology firms are appearing and what factors influence their distribution and growth; identify and evaluate the effectiveness of State and local initiatives to encourage innovation and high-technology development; explore the changing opportunities presented by new and emerging technologies such as robotics and bioengineering; and address the appropriate Federal role in affecting the conditions for such growth in the future.

Delivery date: Technical Memorandum, summer 1983 and fall 1983; Full report, spring 1984. Call 226-2214 for further information.

Requested by: House Committee on Science and Technology. Endorsed by: House Committee on Small Business; House Task Force on Industrial Innovation and Productivity. Joint Economic Committee.

PUBLICATIONS IN PRESS

The following assessment reports were in various stages of production at press time for this booklet.

The report availability date listed is OTA's anticipated production schedule for public release and is subject to priority changes to meet congressional needs. Please call OTA's Publishing Office on 224-8996 for cost and ordering information.

Role of Genetic Testing in the Prevention of Occupational Disease

One of the most difficult problems in regulatory policymaking is determining what is a safe level of exposure to chemicals in the workplace. For any particular chemical, the scientific evidence on risk is often conflicting, and the cost of each incremental lowering of exposure levels becomes increasingly expensive. Further, because of the natural variability of humans, what may be safe for one person, or even the vast majority of people, may be hazardous to another. Accordingly, some occupational health specialists have advocated both genetic screening and cytogenetic surveillance of workers as a means of identifying high-risk individuals and environments where the entire work force may be at risk. The use of these techniques is controversial because the ability to actually identify high-risk workers is a matter of scientific dispute and the identification of such workers, if possible, could place their interests in opposition to those of the company.

This assessment will examine the following questions: What is the technological state of the art? Do the claimed associations in fact exist between certain recessive genes or chromosomal abnormalities and increased risk of harm from certain chemicals? If these associations exist, do genetic screening and cytogenetic surveillance offer a cost-effective way to enhance worker health and safety, given the economic and technical fact of life that workers will face some exposure to chemicals? What are the alternatives, regulatory or otherwise? What responsibilities might companies have toward high-risk workers? How might these tests be done in order to protect the interests of all parties?

Four specific conditions for which screening tests are available will be examined in detail. They are G-6-PD deficiency, methemoglobin reductase deficiency, alpha-1-antitrypsin deficiency, and aryl hydrocarbon hydroxylase inducibility.

Report availability: Early 1983. Call 226-2090 for further information.

Requested by: House committees: Science and Technology; Energy and Commerce.

Technologies and Management Strategies for Hazardous Waste Control

Many nonnuclear industrial hazardous wastes must be stored or disposed of with great care or they may constitute a threat to health and the environment. Information on the nature and magnitude of the hazardous waste disposal and abandoned site problem will be reviewed. The reliability and efficacy of present containment, abatement, and disposal measures will be assessed. This information, coupled with criteria and techniques to judge relative health and environmental hazards of a given waste, will assist in identifying those wastes that could be reduced at the source—by modifications in process technologies, by recycle, or by an end-use substitution. Approaches for reducing hazardous waste generation with minimal undesirable economic effects on domestic industry will be identified.

This assessment has four objectives: 1) to assess criteria for defining hazardous waste and for judging the relative health and environmental hazards of a given waste; 2) to evaluate technologies for cleaning up present waste disposal sites that are hazardous to health and the environment; 3) to assess technologies and approaches for the safe storage or disposal of hazardous waste being presently generated; and 4) to assess technologies and approaches for reducing the volume of hazardous waste. The possible economic impacts on domestic industry of various approaches will be evaluated.

The project will focus initially on understanding the adverse consequences of present disposal strategies and techniques, and next on ways of reducing generation of industrial hazardous waste economically. Alternative options will be developed to cope with hazardous waste disposal in the short run and hazardous waste generation in the long run.

Report availability: Technical Memorandum published November 1981 (see Selected Publications of Interest, p. 40); Full report, early 1983. Call 226-2269 for further information

Requested by: House Committee on Energy and Commerce.

Impact of Technology on Competitiveness of U.S. Electronics Industry

There is a growing concern that key U.S. industries are declining in their international competitive positions. The electronics industry is particularly significant because it occupies a strategic position as a technological driving force for other industries that use products like semiconductors and computers. The OTA assessment will look at three sectors of this industry: consumer electronics (where the United States has suffered heavily from Japanese competition); semiconductors (where a strong U.S. position is under challenge); and computers (where the United States still appears to lead the world).

The assessment will focus on those major contributors to the competitiveness of the electronics industry that could most readily be affected by U.S.

Government policy. In each case, a comparison will be made between the United States, Japan, and (to a lesser extent) Western Europe. These major factors are: 1) commercialization of research, development, and design; 2) manufacturing techniques and resources; 3) finance, including both private and public sources of funds; 4) human resources, both quantity and quality; and 5) governmental/industrial policies.

Report availability: Spring 1983. Call 226-2012 for further information.

Requested by: Senate Committee on Commerce, Science, and Transportation. Joint Economic Committee. House Committee on Ways and Means, Subcommittee on Trade.

Patents and the Commercialization of New Technology

The climate for generating new technologically based enterprises in the United States has worsened during the past decade. Economists differ in their appraisals of the exact contribution such firms make to innovation, employment, and economic progress; however, it is possible that the contribution level is high and that technologically based enterprises are essential to the growth and revitalization of our society. Fledgling entrepreneurs and independent innovators are frequently dependent on, and influenced by, the patent system to a much greater degree than are large, established firms. In almost all aspects of the patent system—e.g., prosecution, interferences, licensing, litigation—small firms and individual inventors face far more difficult obstacles and economic choices than do the large firms. The importance of new technologically based firms to the future economic vitality of the United States underscores the need to assess the impact of the patent system on the generation and stimulation of such enterprises.

Report availability: Spring 1983. Call 226-2240 for further information.

Requested by: House Committee on the Judiciary. Senate Committee on the Judiciary. Endorsed by: House Committee on Small Business.

Impacts of Atmospheric Alterations

Many present-day human activities—particularly the burning of fossil fuels—are altering the Earth's atmosphere in potentially harmful ways. The precise nature and extent of such activities are unclear. However, the potential consequences are severe enough to merit careful congressional consideration of domestic and international Federal policies.

Some of the consequences, such as acid rain, are occurring today. Others, such as global climate changes due to increasing carbon dioxide concentration, may appear within the next century. Increasing sulfur and nitrogen oxides and their transformation products (acid rain and oxidants) may damage

thousands of lakes, decrease crop and forest productivity, deplete soil nutrients, damage buildings and monuments, and have adverse effects on human health.

The assessment will characterize the potential benefits of acting now to abate long-range transport air pollution and the potential costs of action that may be premature. The study will: 1) identify the resources potentially at risk, as well as the societal concerns about the loss of these resources; and 2) identify broad pollution control strategies, and discuss their costs, potential effectiveness, and societal effects. OTA will develop a range of plausible, regionally oriented impact scenarios which describe the potential environmental and social consequences of transported pollutants, and actions that might be taken to control them. These scenarios will not attempt to "forecast" the future, but instead present a range of plausible consequences of these changes, in terms responsive to near-term congressional decisions.

Report availability: Spring 1983. Interim report, published July 1982. Call 226-2131 for further information.

Requested by: House Committee on Energy and Commerce. Senate Committee on Environment and Public Works.

High-Level Radioactive Waste Management and Disposal

More than three decades into the nuclear age, this country still has no permanent disposal facilities for commercial high-level radioactive waste. This assessment focuses on technologies for disposal of commercial high-level waste (spent fuel or solidified waste from reprocessing). A clear understanding of the problem of managing radioactive waste from its generation to final disposal requires comprehensive analysis of the interactive relationships among possible storage and disposal technologies; transportation systems; regulatory considerations; and Federal, State, and local jurisdictional prerogatives. The OTA study used systems analysis technique to evaluate a range of strategies for developing and deploying a commercial high-level radioactive waste disposal system. Other waste forms are considered to the extent needed to determine how their management and disposal will affect commercial high-level waste disposal plans and to provide a basis for analysis for the impacts of, and management problems presented by, a full-scale waste disposal system.

Report availability: Summary published April 1982, full report spring 1983.

Requested by: House Committee on Merchant Marine and Fisheries. Endorsed by: House committees: Science and Technology; and Foreign Affairs; Senate Committee on Energy and Natural Resources.

Technological Innovation and Health, Safety, and Environmental Regulations

This assessment examines the effects of health, safety, and environmental regulation on the rate of productivity growth and on technological innovation in several sectors of the economy. The study also examines alternative regulatory policies with regard to their likely effects on private sector innovation.

Report availability: Spring 1983.

Requested by: Senate Committee on Commerce, Science, and Transportation.

RECENT PUBLICATIONS

This section describes those reports published in reverse chronological order since the last printing of the Assessment Activities booklet, dated September 1982.

Those reports stating that summaries are available can be obtained by calling 224-8996.

Full reports are provided to Members and their staffs for congressional use, if available. Other interested in the full reports can purchase them from the U.S. Government Printing Office or through the National Technical Information Service. Refer to the current OTA Publications Listing (OTA-P-58) or call OTA's Publishing Office (224-8996) for ordering information.

Industrial and Commercial Cogeneration

The need to reduce U.S. dependence on expensive and scarce petroleum as a primary fuel in the industrial, commercial, and electric utility sectors has created a resurgence of interest in cogeneration—the combined production of both electric power and heat or steam in one technological process. Because the total amount of fuel needed to produce both power and heat/steam in a cogenerator is less that the total fuel needed to produce the same amount of power and heat/steam in separate technologies (e.g., a powerplant and an industrial boiler), cogenerators can contribute to our Nation's efforts to use fuel more efficiently. Moreover, problems faced by the electric utility industry, including rapidly rising capital costs, long leadtimes for powerplant construction, and difficulties in finding suitable sites, may make cogenerators an attractive alternative to conventional central station powerplants. This assessment examines the role that cogenerators could play in providing electric and thermal energy for industrial and commercial facilities while distributing electricity to the utility grid. It reviews the economic, environmental, social, and institutional consequences of cogeneration, with a special emphasis on the potential effects on the electric utility industry's planning and operations. Finally, the study analyzes policy options that Congress may wish to consider in addressing the issues about the development of cogeneration systems.

The assessment examines the technical features of commercial and advanced cogeneration technologies, including requirements for connecting cogenerators to the utility grid and technologies for storing thermal or electrical energy. It then evaluates the economic and technical effects of grid-connected cogeneration systems on electric utilities using a computer model that minimizes the costs of providing electric and thermal power. A major

focus of this evaluation is the potential effects of oil- and gas-fired cogenerators on overall oil/gas use. Finally, a series of issues on the incentives for cogeneration in the industrial and commercial sectors, and on the economic environmental, and social effects of cogeneration are examined.

Published: February 1983. Summary available.

Requested by: House committees: Banking, Finance, and Urban Affairs; Energy and Commerce; Science and Technology.

Informational Technology and Its Impact on American Education

Over the last decade, the educational system has been increasingly pressed to meet a variety of new needs on a constant or even shrinking budget. The Federal and State Governments now require that schools provide equal educational opportunities to groups traditionally outside the mainstream, such as the handicapped. Changing needs for job skills and changing demographic conditions also present new demands for education and training beyond the ages traditionally considered as the educational years. Information technology potentially provides opportunities for education systems to improve productivity and quality of instruction, and to offer more flexibility both in content and in the time and place of offering. Previous attempts to enlist technology in education have had mixed outcomes, but the markedly lower cost and increased capability of new and projected computer technology, coupled with advances in telecommunication services, imply the need for a new look at educational use of technologies. The study identifies and projects relevant technology and R&D activity, and the providers and users of curricula, and educational technology, and assesses the likely impacts of selected alternative policies on the use of information technology.

Published: November 1982.

Requested by: House Committee on Education and Labor. Endorsed by: House Committee on Science and Technology. Subcommittee on Science, Research, and Technology.

Postmarketing Surveillance of Prescription Drugs

Before a drug can be prescribed for use in the United States; it must meet minimum statutory requirements for proof of its efficacy and safety as these have been established by the U.S. Food and Drug Administration (FDA). In premarketing testing, the numbers and types of patients exposed to a drug are necessarily limited compared with the numbers and types of patients who will eventually be prescribed the drug after it is marketed. New uses, contraindications, and side effects of drugs will then inevitably be discovered.

Thus, various kinds of postmarketing surveillance have been proposed over the past decade.

Current interest in drug regulation is also focused on the premarketing approval process, because the process has been criticized as unnecessarily delaying the release of valuable drugs in this country. As a result of such criticism, efforts are underway to shorten the approval process through administrative changes within FDA's Office of Drugs, and through revisions of the regulatory interpretations of the statutory requirements for "adequate tests" of a drug's safety and "substantial evidence" of its effectiveness.

This report describes the drug approval process, the history and objectives of postmarketing surveillance, the methods employed to accomplish it, and current activities in postmarketing surveillance. The report provides guidelines to determine whether shortening the drug approval process by various means would diminish its ability to detect adverse drug reactions prior to a drug's release for marketing. The report also identifies oversight issues and options for increased postmarketing surveillance both in the case that Congress decides to relax premarket approval requirements and in the case that it does not.

Published: November 1982.

Requested by: House Committee on Energy and Commerce, Subcommittee on Health and the Environment.

Medical Technology Under Proposals To Increase Competition in Health Care

The indiscriminate use and rising cost of medical technology have figured prominently in discussions of problems that characterize the financing and delivery of medical care. But the development and use of medical technology have also been prominent features of modern medical care in the United States. Thus, it is important to examine the positive and negative implications for medical technology of proposals to restructure the financial incentives of the medical marketplace.

This study analyzes the implications for medical technology of two categories of proposals to increase competition: increased cost sharing by patients when they use medical care; and greater competition among plans that provide health insurance and deliver medical care. After describing the provisions of the two strategies, the study examines the likely effects of each approach on the use and innovation of medical technology, the quality of care provided, and the needs of consumers for information and the availability of information. Although policy options are not provided, the policy implications are raised and discussed.

Published: October 1982. Summary available.

Requested by: House Committee on Energy and Commerce. Endorsed by: Senate Committee on Labor and Human Resources.

MEDLARS and Health Information Policy

Both governmental and private sector organizations create computerized health-related data bases and provide access to them. Government-sponsored health-related bibliographic information is predominantly created and disseminated by the National Library of Medicine's (NLM) computerized system, MEDLARS. One of NLM's legislative mandates is to "aid the dissemination and exchange of scientific and other information important to the progress of medicine and the public health."

This technical memorandum analyzes the arguments for and against NLM's creation and dissemination of health-related bibliographic information. It provides information designed to help Congress in decisions regarding the appropriate mix of NLM and private sector activities that might serve the public interest most efficiently.

A principal finding is that in most respects MEDLARS is an efficient system for disseminating health-related bibliographic information. In regard to the relationship of NLM and the private information sector, OTA's main findings are: 1) that there are insufficient empirical data to decide, on purely technical grounds, the most efficient and effective configuration of public and private bibliographic activities; and 2) that rapid developments in the computer and communications fields may, in the not too distant future, profoundly alter the effects of current decisions.

Published: September 1982.
Requested by: House Interstate and Foreign Commerce Committee, Senate Labor and Human Resources Committee.

SELECTED PUBLICATIONS OF INTEREST

ENERGY, MATERIALS, AND INTERNATIONAL SECURITY DIVISION

***Increased Automobile Fuel Efficiency and Synthetic Fuels: Alternatives for Reducing Oil Imports**—Assesses increased automobile fuel efficiency and synthetic fuels production with respect to their potential to reduce conventional oil consumption, and their costs and impacts.

***Energy Efficiency of Buildings in Cities**—Focuses on the interaction of technology and policy for new and existing buildings in U.S. cities for the next two decades.

***Solar Power Satellite Systems**—Assesses the potential advantages, shortcomings, and impacts of solar satellite systems.

Nuclear Powerplant Standardization—Provides the essential background material for a broad understanding of the nuclear industry, its institutions and their relationship to standardization.

***The Future of Liquefied Natural Gas Imports**—Evaluates projected U.S. demand, global availability, cost and financing, and security of foreign supplies.

***Energy From Biological Processes**—Evaluates the energy potential of plant and animal matter.

Conservation and Solar Energy Programs of the Department of Energy—Analyzes the progress and direction of five major conservation and solar energy programs of the U.S. Department of Energy.

Residential Energy Conservation—Examines the prospects of existing and new technologies for reducing energy consumption in homes.

The Direct Use of Coal: Prospects and Problems of Production and Combustion—Assesses the prospects as well as the environmental, health, safety, and other problems of mining and burning significantly more coal than at present.

Application of Solar Technology to Today's Energy Needs—Evaluates the economic, technical, and environmental impacts of solar energy systems located at the point of use.

***A Technology Assessment of Coal Slurry Pipelines**—Compares the cost of transporting coal by slurry pipelines to rail for certain routes.

***Technology and Soviet Energy Availability**—Analyzes and identifies various levels of availability of U.S. and other Western energy technology and examines the impact on Soviet energy production to 1990.

***MX Missile Basing**—Assesses the technical feasibility, strategic utility, cost, impact on the region, and future consequences of various MX-basing modes.

***U.S. Industrial Competitiveness: A Comparison of Steel, Electronics, and Automobiles**—Extends OTA's efforts in the study of industrial competitiveness to a cross-industry comparison.

***Taggants in Explosives**—Assesses the technical feasibility, safety ramifications, costs, and law enforcement utility of a proposal to require that commercial explosives be manufactured with "identification and detection taggants."

Technology and East-West Trade—Examines the economic, military, and political implications of technology tranfer to the Communist world.

***The Effects of Nuclear War**—Examines the social, economic, political, and health effects of various levels of nuclear attacks on the United States and the Soviet Union.

***An Assessment of Development and Production Potential of Federal Coal Leases**—Analyzes all mining activities, examines present and potential development value, estimates revenues to the Federal Government and deep-mining feasibility on Federal leases.

***Technology and Steel Industry Competitiveness**—Assesses how and when new technology can improve the international competitiveness of the U.S. steel industry.

***An Assessment of Oil Shale Technologies**—Assesses the status and potential of technologies for the development of oil shale resources.

Technical Options for Conservation of Metals: Case Studies of Selected Metals and Products—Explores the kinds and amounts of waste that occur in our use of eight critical metals.

---

*Summary available.

Materials and Energy From Municipal Waste: Resource Recovery and Recycling From Municipal Solid Waste and Beverage Container Deposit Legislation—Examines present and potential technologies for producing energy and recovering resources from municipal solid waste.

Management of Fuel and Nonfuel Minerals in Federal Land—Analyzes Federal laws and practices that govern the exploration, development, and production of fuel and nonfuel minerals in onshore Federal Lands.

Analysis of Laws Governing Access Across Federal Lands: Options for Access in Alaska—Analyzes laws, regulations, and policies affecting access across federally owned lands to minerals on non-Federal lands.

Nonnuclear Industrial Waste: Classifying for Hazard Management: A Technical Memorandum—Reviews the nature and magnitude of hazardous waste disposal.

World Petroleum Availability: A Technical Memorandum—Examines prospects for world oil supplies and production during the next two decades.

Gasohol: A Technical Memorandum—Discusses the technology and economics of gasohol production.

HEALTH AND LIFE SCIENCES DIVISION

***Impacts of Applied Genetics: Micro-Organisms, Plants, and Animals**—Examines the application of classical and molecular genetic technologies to micro-organisms, plants, and animals.

***World Population and Fertility Planning Technologies: The Next 20 Years**—Examines how Government policies and programs view planned birth technologies, and how new international population assistance has changed world population growth in the last 20 years.

***Impacts of Technology on U.S. Cropland and Rangeland Productivity**—Examines the effects of presently used technologies on the capacity of cropland and rangeland resource base to sustain high levels of production.

***U.S. Food and Agricultural Research**—Analyzes the scientific base for establishing national, regional, and local research problems and the role of Federal, State, and private institutions in solving these problems.

***Environmental Contaminants in Food**—Discusses the different types and sources of chemical and radioactive contaminants in food.

***Pest Management Strategies in Crop Protection**—Reviews the array of tactics currently used to control agricultural pests.

Open Shelf-Life Dating of Food—Addresses the practicality, benefits, and costs of open shelf-life dating of food products.

Drugs in Livestock Feed—Analyzes the use of antibacterial and other drugs to promote growth and prevent disease in livestock.

Nutrition Research Alternatives—Evaluates alternative strategies to redirect Federal research toward examining the relationship between nutrition and the changing health problems of Americans.

Organizing and Financing Basic Research To Increase Food Production—Evaluates alternative methods for organizing and funding basic research in the biological sciences.

Perspectives on Federal Retail Food Grading—Assesses the capability of the current food grading system used by the Federal Government.

***Strategies for Medical Technology Assessment**—Examines the appropriateness and validity of existing assessment methods, such as controlled clinical trials, epidemiological studies, and consensus exercises.

***Technology and Handicapped People**—Provides information on general issues, such as the state of the art of evaluating efficacy, safety, and cost.

Cost-Effectiveness Analysis of Inactivated Influenza Vaccine—Examines the cost effectiveness of influenza vaccine.

***Assessment of Technologies for Determining Cancer Risks From the Environment**—Examines four major issues: estimates of the percentage of cancer due to environmental exposure, technologies used to test for carcinogenicity, methods used for extrapolating data from animals to humans, and regulatory pathways for controlling carcinogens.

The Implications of Cost-Effectiveness Analysis of Medical Technology—Analyzes the feasibility, implications, and usefulness of cost-effectiveness analysis and cost-benefit analysis in health care decisionmaking.

Forecasts of Physician Supply and Requirements—Analyzes the assumptions, methods, and conclusions of the technologies for forecasting both the need for and supply of physicians by specialty and geographical distribution.

A Review of Selected Federal Vaccine and Immunization Policies Based on Case Studies of Pneumococcal Vaccine—Analyzes Federal policies related to four areas of vaccine and immunization activities.

Selected Topics in Federal Health Statistics—Examines data systems used in Federal health programs and offers alternatives for their effective management.

*Summary available.

Assessing the Efficacy and Safety of Medical Technologies—Evaluates the need for assessments of the efficacy and safety of medical technologies before they go into widespread use.

Policy Implications of the Computed Tomography (CT) Scanner—Analyzes issues such as efficacy, health planning, use, and financing arising from the widespread adoption of the CT scanner.

Policy Implications of Medical Information Systems—Examines the potential of computer-based medical information systems.

Cancer Testing Technology and Saccharin—Assesses the capacity of current testing methodology to predict the carcinogenic potential of chemicals consumed by humans.

Development of Medical Technology: Opportunities for Assessment—Examines the need for assessing the potential social impacts of emerging medical technologies while they are being developed.

Technology Transfer at the National Institutes of Health: A Technical Memorandum—Presents general information on biomedical R&D and its relationship to technology transfer, and on the processes of transferring medical technology and of assessing that technology.

Compensation for Vaccine-Related Injuries: A Technical Memorandum—Reviews the pros and cons of establishing a Federal vaccine injury compensation program.

SCIENCE, INFORMATION, AND NATURAL RESOURCES DIVISION

***Radiofrequency Use and Management: Impacts From the World Administrative Radio Conference of 1979**—Reviews the U.S. preparations for and participation in WARC-79, identifies its major results and projects their impacts.

***Computer-Based National Information Systems: Technology and Public Policy Issues**—Summarizes and analyzes three U.S. information systems: National Crime Information Center of the FBI, electronic message systems, and electronic funds transfer.

***Alternatives for a National Computerized Criminal History System**—Assesses the use and operation of computerized criminal history systems by Federal law enforcement agencies.

***Implications of Electronic Mail and Message Systems for the U.S. Postal Service**—Evaluates the impact of electronic message systems (EMS) on operations of the U.S. Postal Service and assesses alternative roles for the Postal Service in provision of EMS and services.

Patent-Term Extension and the Pharmaceutical Industry—Examines the benefits and efficacy of pharmaceutical innovation and research and development.

The Feasibility and Value of Broadband Communications in Rural Areas: A Preliminary Evaluation—Examines the issues involved in using communication technologies—such as cable television, ground- or satellite-based microwave links, and automatic broadcast repeater stations—to provide community services in rural areas.

***Use of Models for Water Resources Management, Planning, and Policy**—Evaluates methodologies, findings, and implications of Global 2000 and other global modeling studies.

***Technology and Oceanography: An Assessment of Federal Technologies for Oceanographic Research and Monitoring**—Identifies the technologies and management systems that are most effective in researching four areas: weather and climate, marine pollution, undersea mineral exploration, and fisheries.

Transportation of Liquefied Natural Gas—Evaluates the status and trends of ongoing and proposed projects involving the transportation and handling of liquefied natural gas.

Establishing a 200-Mile Fisheries Zone—Evaluates the problems and opportunities presented by the new 200-mile U.S. fishery zone.

Coastal Effects of Offshore Energy Systems—Assesses social, economic, and environmental impacts of three proposed offshore energy systems.

***Review of FAA National Airspace System Plan**—Critiques the FAA National Airspace System Plan.

***Civilian Space Policy and Applications**—Explores Federal involvement in space R&D, when and under what circumstances commercial involvement is appropriate.

***Global Models, World Futures, and Public Policy—A Critique**—Examines global models as a tool for long-range strategic analysis and policy development.

Airport and Air Traffic Control System—Examines the likely future evolution of domestic aviation.

***Impact of Advanced Air Transport Technology**—Examines the impact of introducing or not introducing advanced high-speed aircraft into our future commercial fleet.

***Impact of Advanced Group Rapid Transit Technology**—Examines second-generation automated guideway transit systems as part of a solution to the need for improved urban mass transit.

*Summary available.

Changes in the Future Use and Characteristics of the Automobile Transportation System—Describes energy, environmental, safety, and cost impacts of technological changes.

An Evaluation of Railroad Safety—Evaluates trends in railroad-related accidents.

An Assessment of Community Planning for Mass Transit—Assesses the ways cities plan for mass transit.

***An Assessment of Technology for Local Development**—Assesses several prototype technologies, the local problems they may alleviate, and their feasibility and potential impacts.

Space Science Research in the United States: A Technical Memorandum—Summarizes and critiques the views of many people interested in space science.

Coal Exports and Port Development: A Technical Memorandum—Addresses four major issues that are important to Federal policy debate: estimating the potential U.S. coal export market, development of foreign trade policy, the Federal role in dredging harbors, and the outlook for alternative technologies.

Ocean Margin Drilling: A Technical Memorandum—Evaluates a proposed public-private cooperative research effort in marine geology.

Recent Developments in Ocean Thermal Energy: A Technical Memorandum—Reviews status of ocean thermal energy conversion (OTEC) developments occurring after OTA's 1978 report on OTEC.

For information on availability and price of these publications, please call OTA's Publishing Office (224-8996)

*Summary available.

General Information

Contacts Within OTA

(OTA offices are located at 600 Pennsylvania Avenue, S.E., Washington, D.C.)

Office of the Director 224-3695
Congressional Relations and Public Affairs Office 224-9241
Energy, Materials, and International Security Division 226-2253
Health and Life Sciences Division 226-2260
Science, Information, and Natural Resources Division 226-2253
Administration Office 224-8712
Personnel Office 224-8713
Publications 224-8996

Reports and Information

To obtain information on availability of published reports, studies, and summaries, call the OTA Publishing Office, 224-8996.

For information on the operation of OTA, the nature and status of ongoing assessments, or the general publications listed below, write or call:

Congressional Relations and Public Affairs Office
Office of Technology Assessment
U.S. Congress
Washington, D.C. 20510
(202) 226-2115

General OTA Publications

OTA Annual Report.—Details OTA's activities and summarizes reports published during the preceding year.

List of Publications.—Catalogs by subject area all of OTA's published reports with instructions on how to order them.

Publication Briefs.—One-page summaries of OTA reports.

Press Releases.—Announce publication of reports, staff appointments, and other newsworthy activities.

OTA Brochure.—"What OTA Is, What OTA Does, How OTA Works."

Assessment Activities.—Contains brief descriptions of assessments presently under way, with estimated dates of completion.

Summaries of OTA Reports.—The summaries of most OTA reports published since late 1979 are available, at no cost, as separate, self-mailing booklets.

U.S. GOVERNMENT PRINTING OFFICE : 1983 O - 16-973

CONGRESS OF THE UNITED STATES
OFFICE OF TECHNOLOGY ASSESSMENT
WASHINGTON, D.C. 20510

OFFICIAL BUSINESS
PENALTY FOR PRIVATE USE, $300

POSTAGE AND FEES PAID
OFFICE OF TECHNOLOGY ASSESSMENT

U.S.MAIL

Excerpt From Technology Assessment Act of 1972
Public Law 92-484, 92d Congress, H.R. 10243
October 13, 1972

"FINDINGS AND DECLARATION OF PURPOSE

SEC. 2. The Congress hereby finds and declares that:

(a) As technology continues to change and expand rapidly, its applications are—

(1) large and growing in scale; and

(2) increasingly extensive, pervasive, and critical in their impact, beneficial and adverse, on the natural and social environment.

(b) Therefore, it is essential that, to the fullest extent possible, the consequences of technological applications be anticipated, understood, and considered in determination of public policy on existing and emerging national problems."

OTA-PC-105 (Revised February 1983)